WSRC-RP-90-522

BACKPULSE AND FILTER FEED VELOCITY EFFECTS ON NORTON FILTER PERFORMANCE (U)

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This paper was prepared in connection with work done under Contract No. DE-AC09-89SR18035 with the U. S. Department of Energy.

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WSRC-RP-90-522

Keywords: ETF, Norton Filters, Backpulse, Filter Feed Velocity

Retention time: Permanent

May 8, 1990

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Backpulse and Filter Feed Velocity Effects on Norton Filter Performance

SUMMARY

A series of tests have been conducted at TNX using the 2.2 ft^2 Norton filter to solve the fouling problems observed with the ETF Norton system. The objective of these tests was to determine filter efficiency as a function of backpulse strength and feed velocity.

Based on experimental results, I recommend that the filters should be operated at the following conditions:

1. Backpulse Transmembrane Pressure/Feed Transmembrane Pressure (BP/FP) > 1.5, preferably 2 or 3.

2. Feed crossflow velocity = 6-8 f/s.

It is expected that operation at these conditions should improve performance by 30-60%.

DISCUSSION

Effect of Feed Crossflow Velocity - The results from these tests indicate that operating at a feed velocity of 6-8 f/s improved the filter performance over operation at 10-12 f/s (present Plant conditions). Figure 1 shows that the flux loss after 20 hours of operation increased from 45% to 65% for feed velocities of 6 f/s to 12 f/s, respectively. This is probably due to the formation of a more effective dynamic filter layer at 6 f/s, resulting in less particulate penetration into the filter. The results obtained at

6 and 8 f/s were nearly identical. The ETF could utilize these results by using smaller feed pumps.

Effect of Backpulse Efficiency - Figure 2 shows filter flux data for three different backpulsing conditions:

BP/FP RATIO	BACKPULSE DUR./FREQ.
1.5	3 seconds/3 minutes
1.5, then 3	3 seconds/2 hours, then 3 seconds /3 minutes
3	3 seconds/3 minutes

Figure 2 indicates that present Plant conditions do not allow for efficient backpulsing, which is crucial to filter operation and life. Altering the backpulsing conditions from BP/FP = 1.5 to 3 restored a substantial amount of lost capacity and, more importantly, resulted in the same flux behavior at 20 hours as occurred from starting the test at BP/FP = 3. Operating at BP/FP = 1.5 with backpulsing set at three minutes appeared to give slightly better performance (in terms of flux restoration) than with backpulsing set at two hours.

There are several methods to boost the pressure ratio. The easiest method is to install an orifice plate in the filter feed line. This would reduce the feed pressure. The negative aspect is that lower feed pressure could limit filter productivity as the filters become fouled (i.e., lower maximum pressure = lower maximum flux). A second, more costly alternative is to increase backpulsing pressure, which could possibly require extensive system modifications.

It should be stressed that these results were obtained using simulants, and that various feed solutions could give different results. The results are intended to be viewed on a relative basis.

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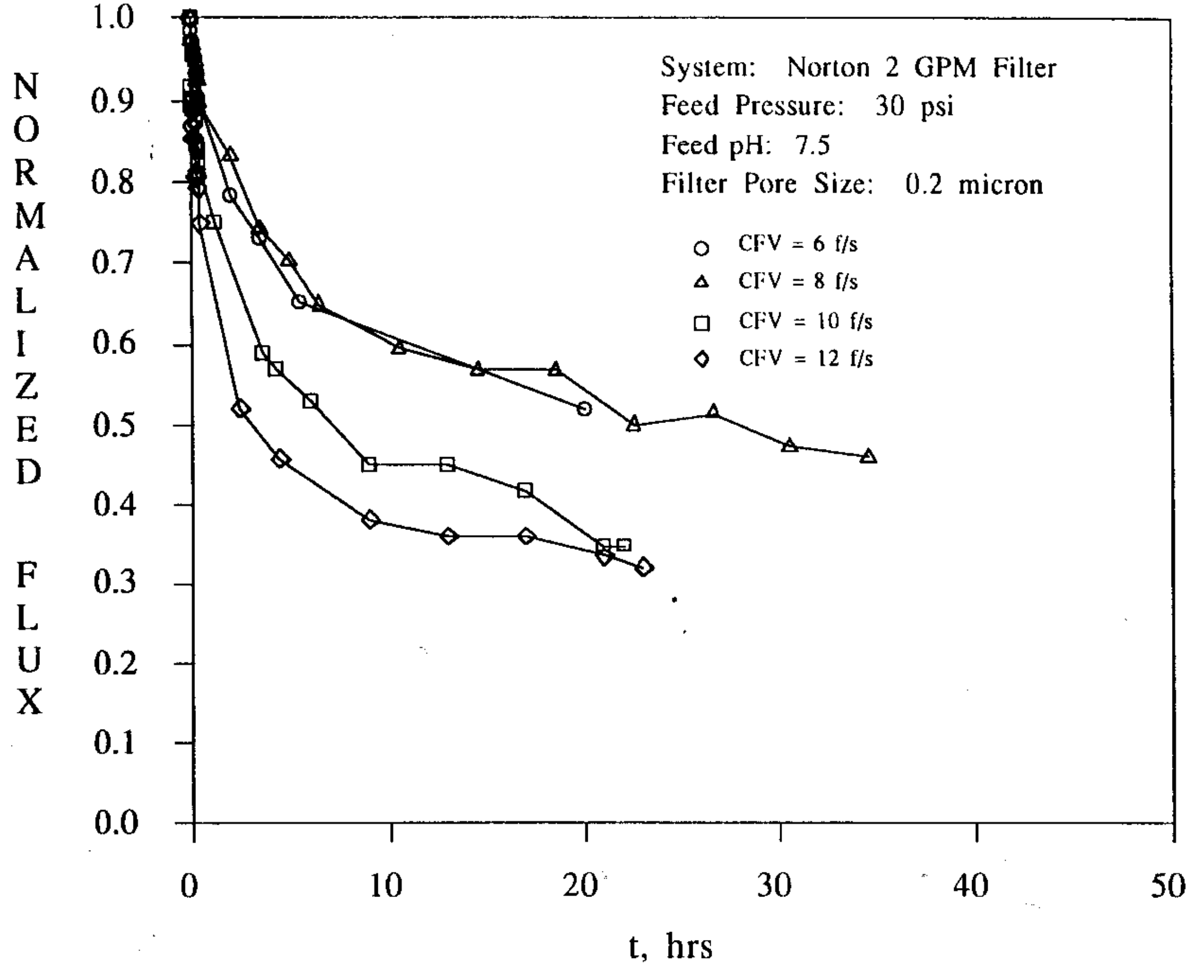

Figure 1 - Filterability of D Tank Simulant as a Function of Feed Velocity.

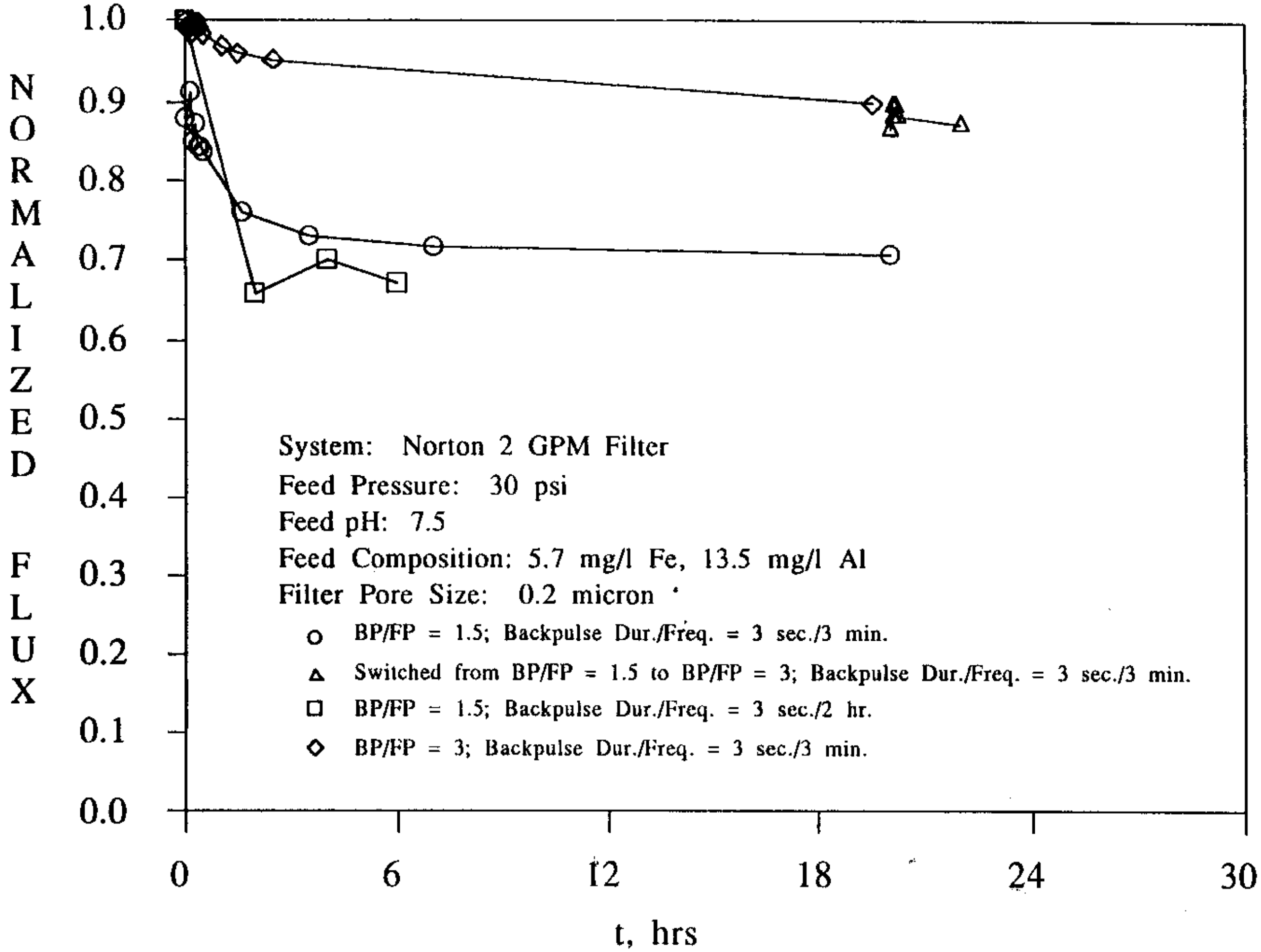

Figure 2 - Filterability as a Function of the Backpulse to Feed Pressure Ratio.